Recent studies have proved the collagen shield to be an excellent vehicle for drug delivery to the eye. Dexamethasone, gentamicin, tobramycin, and vancomycin hydrochloride all have been shown to have equal or greater concentrations in the cornea, aqueous, and iris when a soaked collagen shield was placed on the eye as when hourly drops or subconjunctival injections were used. The shields also have been shown to enhance corneal epithelialization postoperatively and after corneal abrasions.

In light of this recent research, some ophthalmologists are now routinely using collagen shields soaked in antibiotics and corticosteroids postoperatively as a replacement for subconjunctival injections in cataract, corneal, and anterior segment procedures. Follow-up has shown these eyes to be less inflamed in the immediate postoperative period with less discomfort. Other potential applications are using the shield in treating bacterial corneal ulcers, enhancing the healing of persistent epithelial defects or neurotrophic corneal ulcers, and possibly as an adjunct to dry eye therapy.

The collagen shields' capability of drug delivery, protection, lubrication, and accelerating epithelialization makes them particularly useful in ophthalmic surgical procedures and should prove to be a valuable therapeutic tool.

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Botulinum Toxin for the Treatment of Blepharospasm and Strabisumus

IN HIS PIONEERING WORK, Scott showed that an injection of small quantities of a purified reconstituted solution of botulinus toxin type A (Oculinum) into an extraocular muscle will cause a dose-related but temporary paralysis of the muscle. The drug is intended as a medical alternative to the surgical procedures currently used to treat blepharospasm and certain strabismus conditions. A chemically denervated muscle will cause a change in the position of the eye. With prolonged administration, some degree of contracture of the antagonist muscle is thought to occur, presumably resulting in a lasting alteration of ocular alignment.

The Food and Drug Administration (FDA) has recently granted premarket approval to botulinus toxin for treating blepharospasm and strabismus in patients at least 12 years old. Oculinum, which is a lyophilized form of purified botulinus toxin type A, blocks neuromuscular conduction. When injected in therapeutic doses, it produces a local denervation muscle paralysis that is useful in reducing the severe muscle contractions associated with blepharospasm. Botulinus toxin type A is administered by a subcutaneous injection at specific sites around the eye. Its beneficial effects last an average of 12½ weeks. Injections may need to be repeated, and this should not be viewed as a failure.

In one clinical study, botulinus toxin type A was administered to 27 patients with essential blepharospasm, 26 of whom had been treated unsuccessfully with benztropine mesylate, clonazepam, baclofen, or some combination of the three. Of the 27 patients, 25 reported improvement within 48 hours of the initial treatment. One patient's blepharospasm was later controlled with a higher dose. The other patient reported only mild improvement. In an open trial to test the effectiveness of the antitoxin in treating strabismus, 667 patients with strabismus were given one or more injections of the drug. Of the 667 patients, 55% had improved to an alignment of ten prism diopters or less when evaluated six months or more after injection. To date, 4,000 patients have received more than 7,000 injections to treat strabismus. Likewise, in the treatment of blepharospasm, more than 4,000 patients have received well over 7,000 treatments.

Although some practice with the technique is important, once the skill is acquired, it is a relatively safe office procedure for treating strabismus that requires only an injection of the drug into the extraocular muscle. Although successive treatments may be necessary, the success rate approaches that of standard strabismus surgical procedures.

At this time, the FDA has released botulinus toxin type A for the treatment of strabismus in patients 12 years of age and older, excluding it for the treatment of childhood strabismus and particularly for infantile esotropia. Currently, however, there are research protocols in effect for the treatment of congenital esotropia, and early reports indicate promising results.

Transient ptosis has been reported as a side effect in about a third of the patients, and some investigators have reported unexpected hypertropias at a rate of 15%. Other complications that have been reported are 9 cases of scleral perforation, none of which resulted in retinal detachments, and 15 cases of retrobulbar hemorrhage, again with no permanent disability resulting.

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Evaluating Functional Vision

VISION TRADITIONALLY HAS BEEN evaluated using a Snellen chart and notation. The chart presents black and white letters of different sizes that are scaled to quantify the resolution of the eye. Patients frequently complain that their vision deteriorates as they age and that they have trouble seeing to drive at night. The Snellen eye chart often reveals normal acuity in these persons. The standard eye chart was developed during the Civil War period before the invention of the electric light bulb or high-speed driving. Disorders such as cataracts, diabetes mellitus, and macular degeneration may not be evaluated properly with the existing eye chart. The term functional vision has been coined to describe what we need to test. This denotes the visual ability to perform under various lighting situations.

The Snellen system tests the resolution of our eyes with black letters on a white background. Most of our vision is achieved by detecting the differences between borders, however. The degree that a person can determine the sub-

tlest change gives us an important measure of the quality of vision. This kind of testing is called contrast sensitivity. There are two clinical testing systems in use today. The first presents to the patient sine wave gratings in which either the frequency or the contrast can be changed. Each eye is independently shown a target of vertical gratings. The grayest resolvable grating represents the contrast sensitivity for that frequency. The gratings are then made narrower and the entire process is repeated. The second system is easier to administer and is clinically more available. A patient simply is shown different-sized letters that are grayed out until they can no longer be read. This system is easier to do clinically and relates contrast sensitivity to the standard Snellen notation.

Another important measure of functional vision is how well we see in situations of glare. It is possible to have normal acuity and contrast sensitivity and to be completely blinded in the presence of any strong extraneous light source. Frequently patients have complaints of headlights obscuring their night vision. Even during the day, strong front lighting can wash out their vision. New tests have been devised that challenge acuity and contrast sensitivity in the presence of a glare source.

As we age, acuity may remain in the 20/20 range but our contrast and glare capabilities diminish. Frequently by age 70, patients' contrast has so diminished that they have difficulty driving at night. In the dark, it is hard to see on poorly illuminated roads. Tests based on contrast sensitivity may be used in the future to assess a person's visual fitness for driving.

Cataracts are a disorder of aging that can be well evaluated with the above tests. Various government reimbursement programs now require certain visual standards before they will allow ocular operations. Hence, measuring contrast and glare in addition to standard Snellen acuity is a useful adjunct in further characterizing visual loss.

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Extended-Wear Soft Contact Lenses

ACCORDING TO A RECENT Food and Drug Administration survey, nearly 20 million Americans wear contact lenses with most using soft lenses. Soft contact lenses can be used either on a daily-wear basis in which the lenses are removed and disinfected each day or on an extended-wear basis with the lenses worn overnight for a variable number of days. The most serious complication of contact lens use is bacterial corneal ulcers, which may result in corneal scarring and loss of vision requiring corneal transplantation.

Recent reports suggest that the risk of bacterial corneal ulcers is greater with the use of extended-wear than daily-wear soft contact lenses. A multicenter case-control study confirmed this observation and showed that users of extended-wear soft contact lenses who wore them overnight had a risk of bacterial corneal ulcers that was 10 to 15 times as great as that for users of daily-wear soft contact lenses.

Bacterial corneal ulcers in contact lens wearers probably require two conditions: the presence of pathogenic microorganisms that may be contaminating the eye or some aspect of the care system and a break in the corneal epithelium either from trauma or hypoxia caused by the contact lens. The use of an extended-wear soft contact lens may be associated with chronic corneal hypoxia that may disturb epithelial metabolism and result in epithelial defects through which pathogenic bacteria gain access to the corneal stroma.

Disposable soft contact lenses are extended-wear hydrogel contact lenses that are intended to be worn either six-nights-on, one-night-off and then discarded or on a daily basis and discarded every two weeks. Disposability is practical because these lenses are inexpensive.

Disposable soft contact lenses may have several advantages. First, they may reduce problems caused by noncompliance with good lens care because less lens cleaning or disinfection is required. Furthermore, the risks associated with aging lenses, such as cracks or other surface defects that might allow microbial penetration or deposits that might facilitate bacterial adherence, should be reduced. Other possible benefits include eliminating some of the allergic and toxic complications of contact lens care products. Despite all these advantages, the disposable lens has an oxygen transmissibility that is similar to other hydrogel contact lenses. In other words, this lens may be just as likely to cause chronic hypoxic stress to the cornea as other hydrogel lenses when used on an extended-wear basis. Although bacterial corneal ulcers have been associated with the use of disposable lenses, it is not known whether they are safer than other hydrogel lenses in this regard.

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Update on Retinopathy of Prematurity

RETINOPATHY OF PREMATURITY (ROP), previously known as retrolental fibroplasia, is a proliferative disorder of infant retinal blood vessels that can lead to blindness. While previously associated with the administration of oxygen in excess of need, the single most important factor that determines whether the condition develops under conditions of modern neonatal intensive care is the degree of an infant's prematurity. Although most cases of ROP regress spontaneously, infants with very low birth weights have a greatly increased incidence of ROP that is likely to be severe. With recent increased survival rates for infants weighing much less than 1,000 grams at birth, blindness due to ROP has become an international concern.

Retinopathy of prematurity now is classified according to an international system that allows clinical investigators to communicate better. Using that system, a multicenter clinical trial (Cryo-ROP) showed that cryotherapy administered for stage III+ ROP approximately halved the rate of poor anatomic outcomes as defined by the study. In the Cryo-ROP study, only one eye of symmetrically affected infants was treated, and current recommendations generally continue this practice because of the unknown long-term fate of treated eyes.

The availability for the first time of effective treatment